



***Transformational
Communications
and the AF SATCOM Family of
Terminals: **Mr. John Atwood**
The Way Ahead **ESC/MCV*****



Outline

- Transformational Communications – a quick overview
- How AF SATCOM terminals “fit” into the TC network-centric world
- AF SATCOM Terminal programs
 - Family of Advanced Beyond-Line-of-Sight Terminals (FAB-T)
 - Ground Multi-Band Terminal (GMT)
 - Airborne Lasercom Terminal
- Building an evolvable terminal product line
 - Family of Terminals (FOT) Concept
- Roadmap



Transformational Communications Vision

An **internet-like transport** architecture between space, air and ground nodes

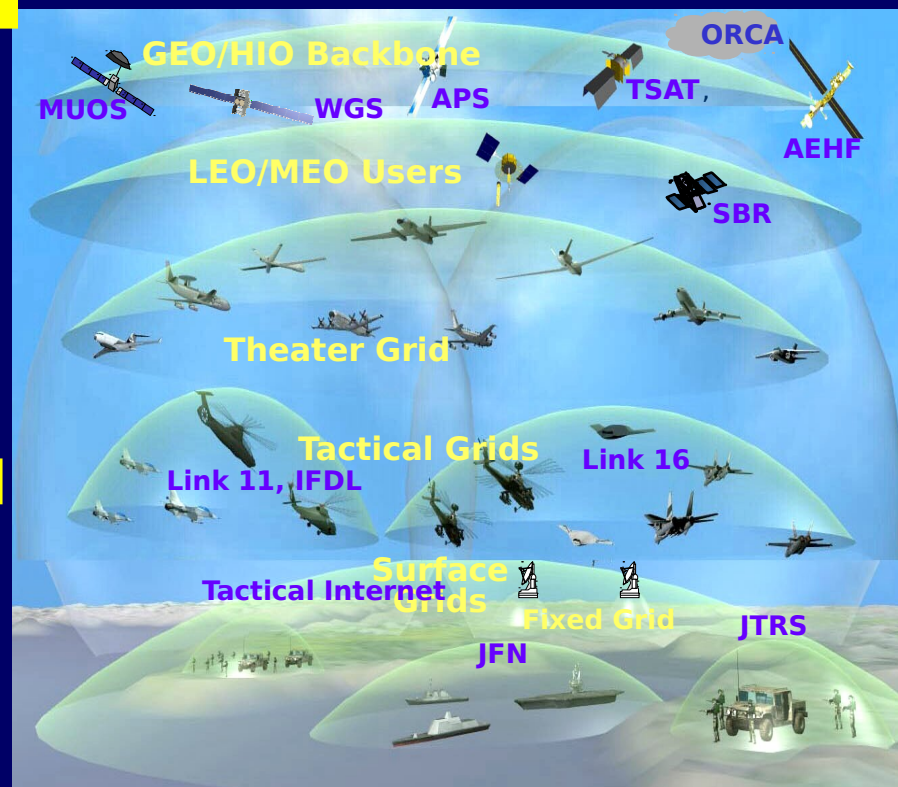
Integrated Space, Air and Ground Networks

Global access to deployed / mobile Users (COTM)

Timely delivery of air and space data to Theater and CONUS (AISR, SISR support)

Automated, dynamic, high assurance network operations

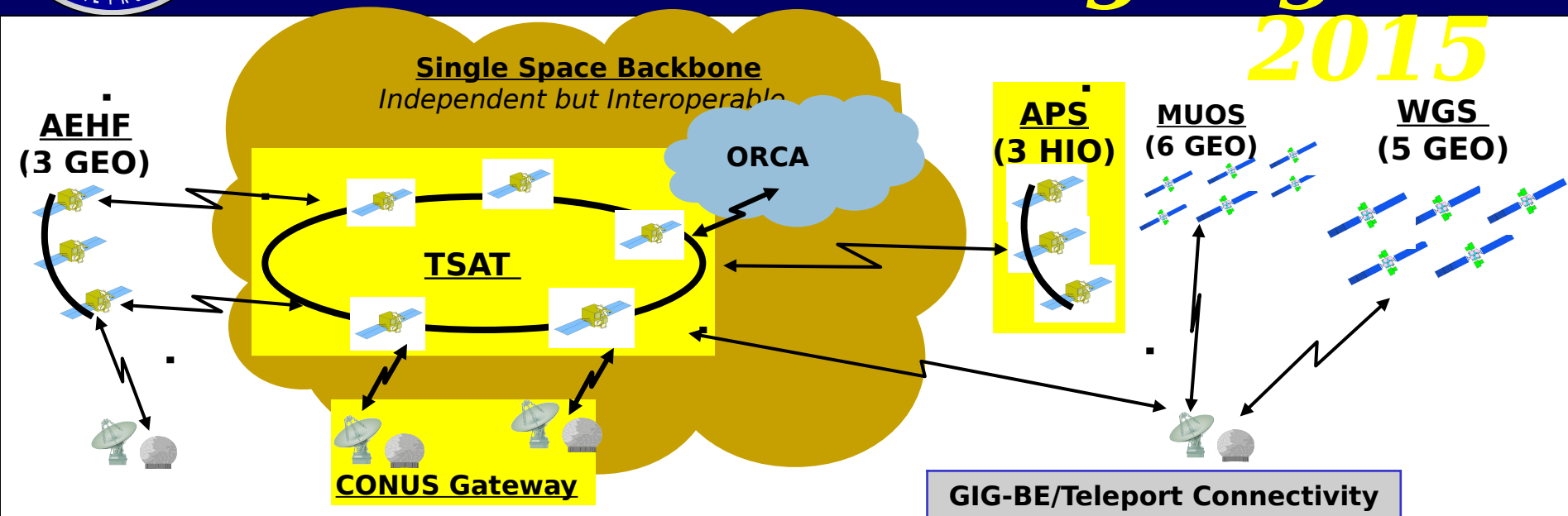
Increased capacity and connectivity: RF and laser communications network



Goal: Remove Communications as a constraint to the user



TCA DoD Space Highlights 2015



AEHF Features:

- Protected
- Strategic survivable
- AEHF RF crosslinks to TSAT

APS Features:

- Protected, XDR (Processed EHF)
- Strategic survivable
- LC crosslink to TSAT
- IP + Circuit

TSAT Features:

- Protected, XDR+ (Processed EHF)
- Processed X Band in Spiral TBD
- Strategic survivable
- RF crosslink to AEHF (TSAT SV 1, 2)
- LC and RF Ka AISR
- IP + Circuit

WGS

- Features:
- X, Ka
 - SV4/5 Modified for 274 Mbps AISR

AEHF: Adv Extremely High Frequency

WGS: Wideband Gapfiller Satellite

MUOS: Mobile User Objective System

ORCA: Optical Relay Comm Architecture

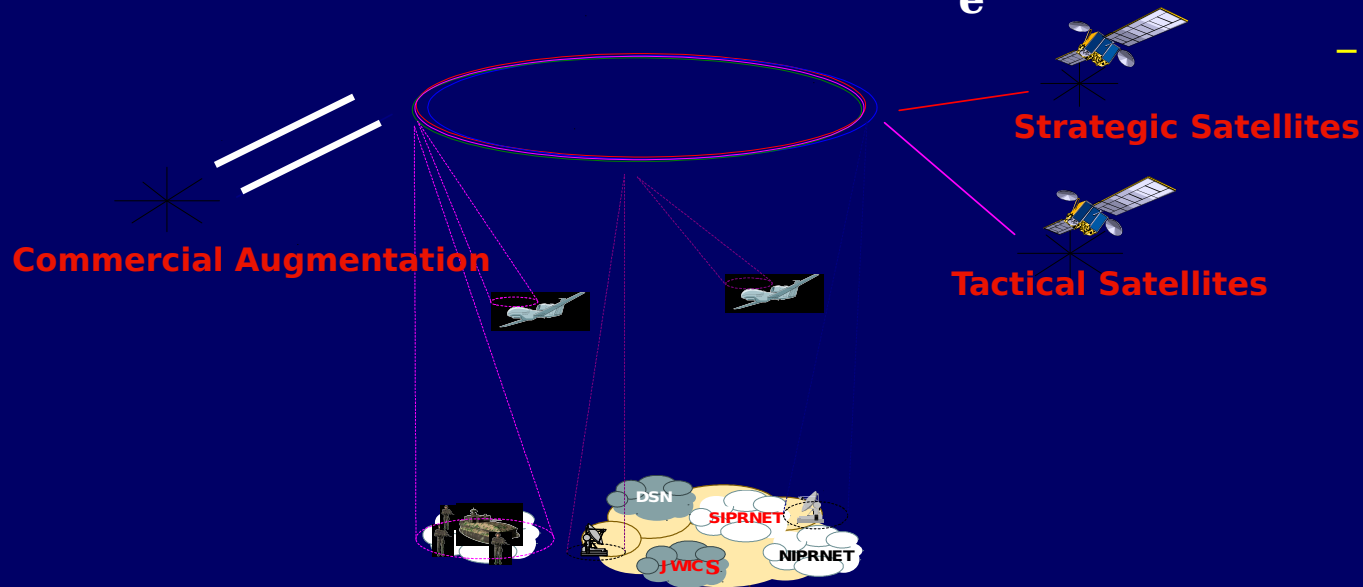
End-to-End Network Connectivity

AF TC MILSATCOM Acquisitions



GRA Networking Goals

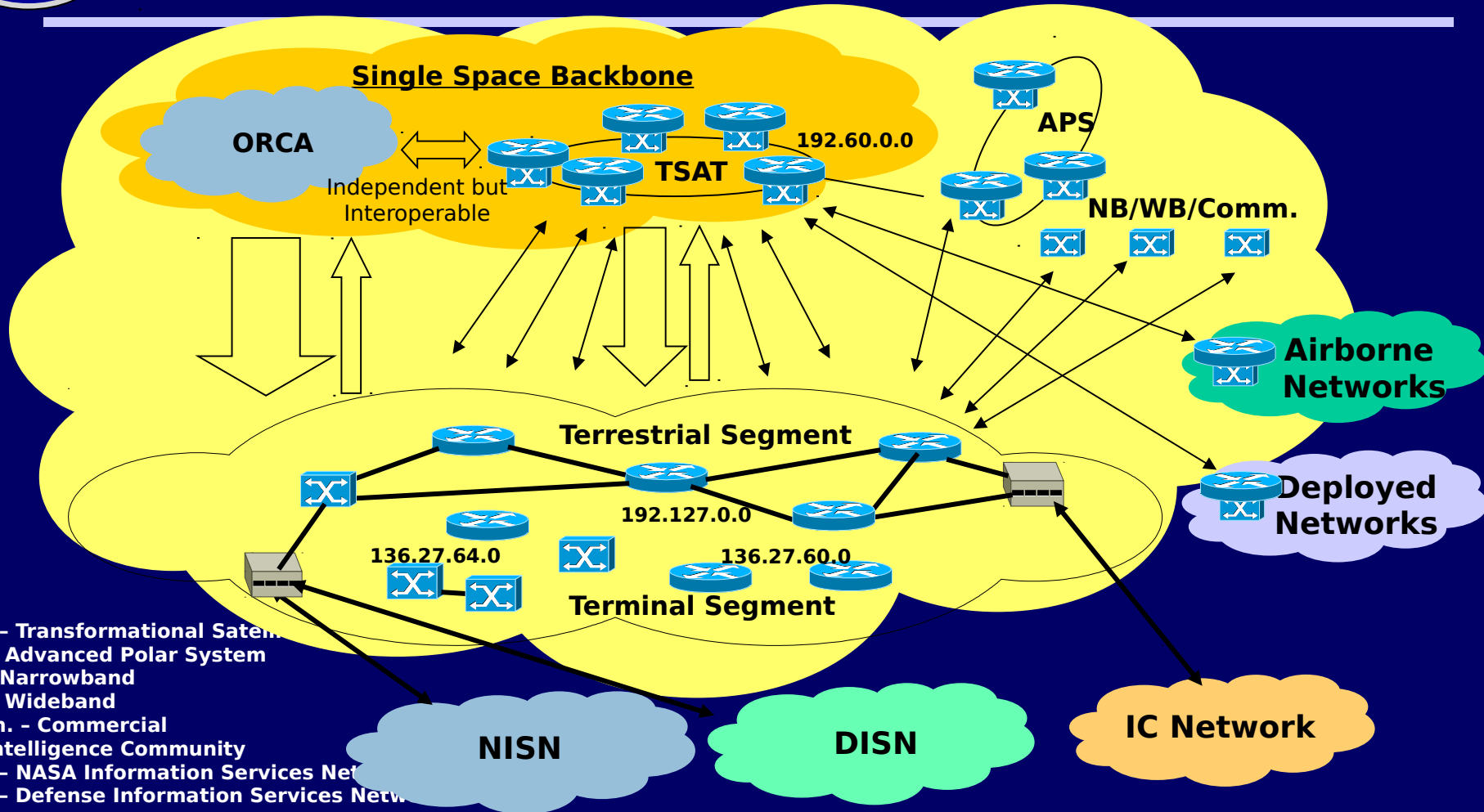
- **Flexibility**
 - **Extensibility**
 - **Scalability**
 - **Responsiveness**
 - **Evolvability**
- **Security**
 - **Information Assurance**
 - **Observability**
- **Information Sharing**
 - **Collaboration**
 - **Timeliness**
 - **Information Interexchange**
- **Interoperability**
 - **Cross-System**
 - **Cross-Element**
 - **Joint**



Enable Future Innovations and Growth Through A Flexible Yet Secure Network Architecture



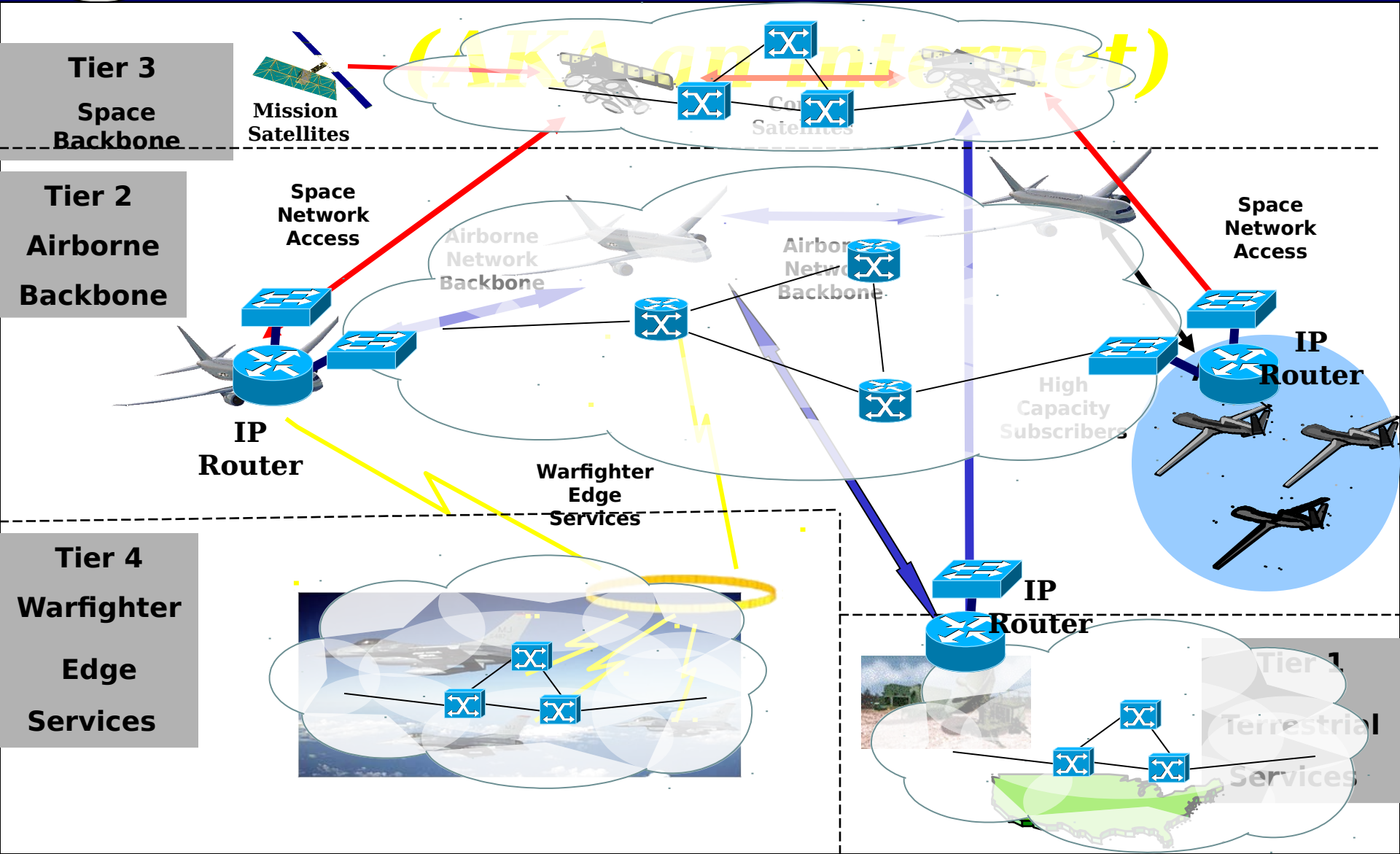
TC Network



Anyone, anywhere, anytime

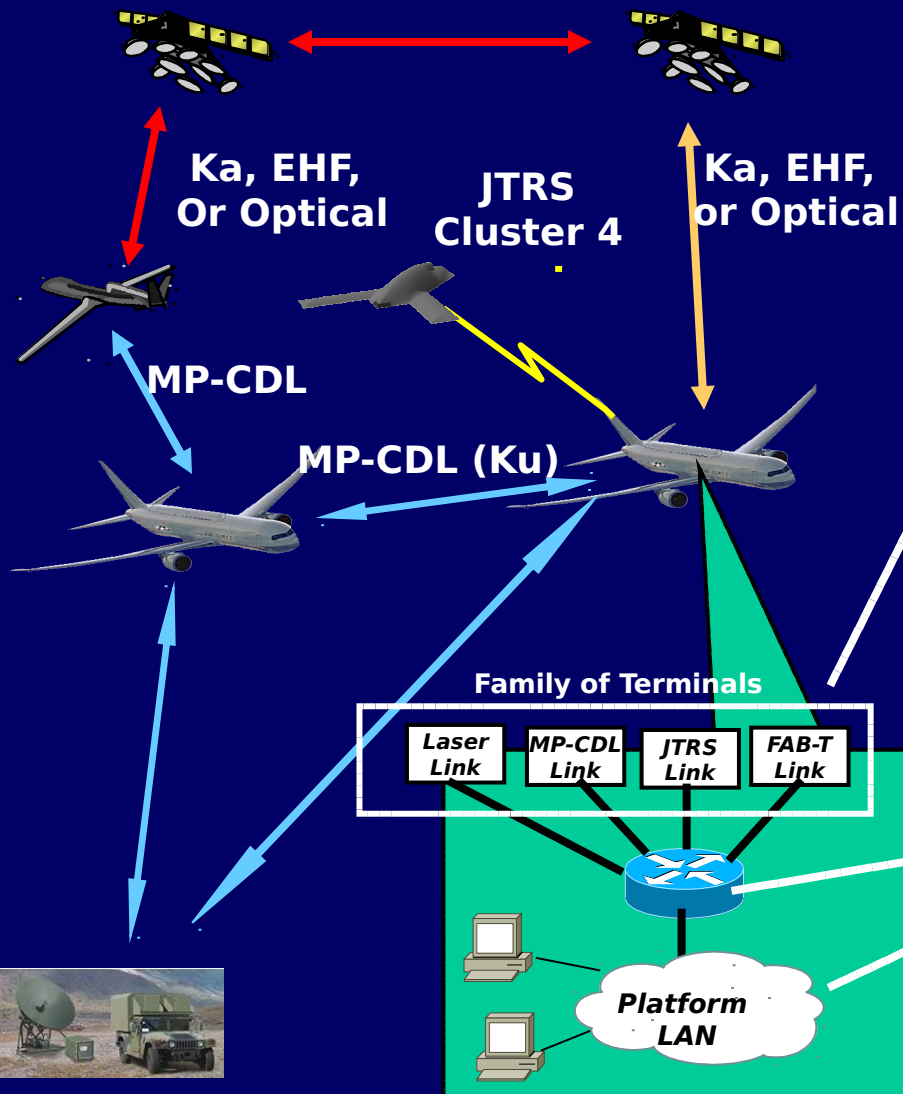


The Network of Networks





Internetworking Key to Airborne & Space Network



- Network-enabled links
 - Planned investments will deliver multiple comm solutions to airborne platforms
- Integrating network architecture
 - Internetworking between comm solutions creates robust network
 - Link diversity increases network and application availability
- Network-enabled platform infrastructure
 - On-board LAN extends network capability to end users



TC Network Impacts on AF Terminals

Terminals must . . .

- Provide interface between commercial internet standards-based networks and DoD-specific networks
 - To support IP traffic as well as legacy traffic
- Adopt Internet model of IP over heterogeneous link layers for interoperability and end-to-end connectivity
- Provide connections between various TC networks
- Provide information about their SATCOM links to network manager (e.g. link status)
- Use standard network management techniques (e.g., SNMP)

**Antennas are a critical element in the TC
architecture**



ESC/MC Terminal Programs

Today

Near Term

TC Era

Protected

- Milstar Command Post
- Secure Mobile Anti-Jam Reliable Tactical Terminal (SMART-T)
- Single Channel Anti-Jam Man Portable (SCAMP)



Wideband

- Defense Satellite Communications System (DSCS)
- Global Broadcast Service (GBS) Receive Suites

Narrowband

- AFSOC DAMA Airborne
- Spitfire/MBMMR

Narrowband

- Airborne Integrated Terminal (AIT)
- Spitfire/MBMMR

Wideband

- IP-based Global Broadcast Service (GBS)
- DSCS
- Ground Multi-Band Terminal (GMT)



Protected

- SMART-T
- SCAMP
- Milstar Command Post



Protected

- Family of Advanced Beyond-Line-of-Sight Terminal (FAB-T)
- SMART-T (AEHF)
- SCAMP (AEHF)

Wideband

- FAB-T
- Lasercom
- DSCS
- GMT

Narrowband

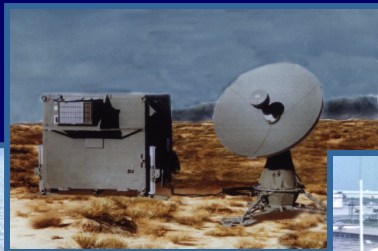
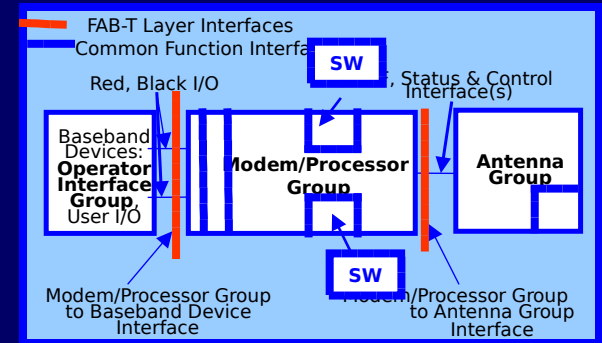
- AIT
- Spitfire/MBMMR





FAB-T Increment 1 Scope

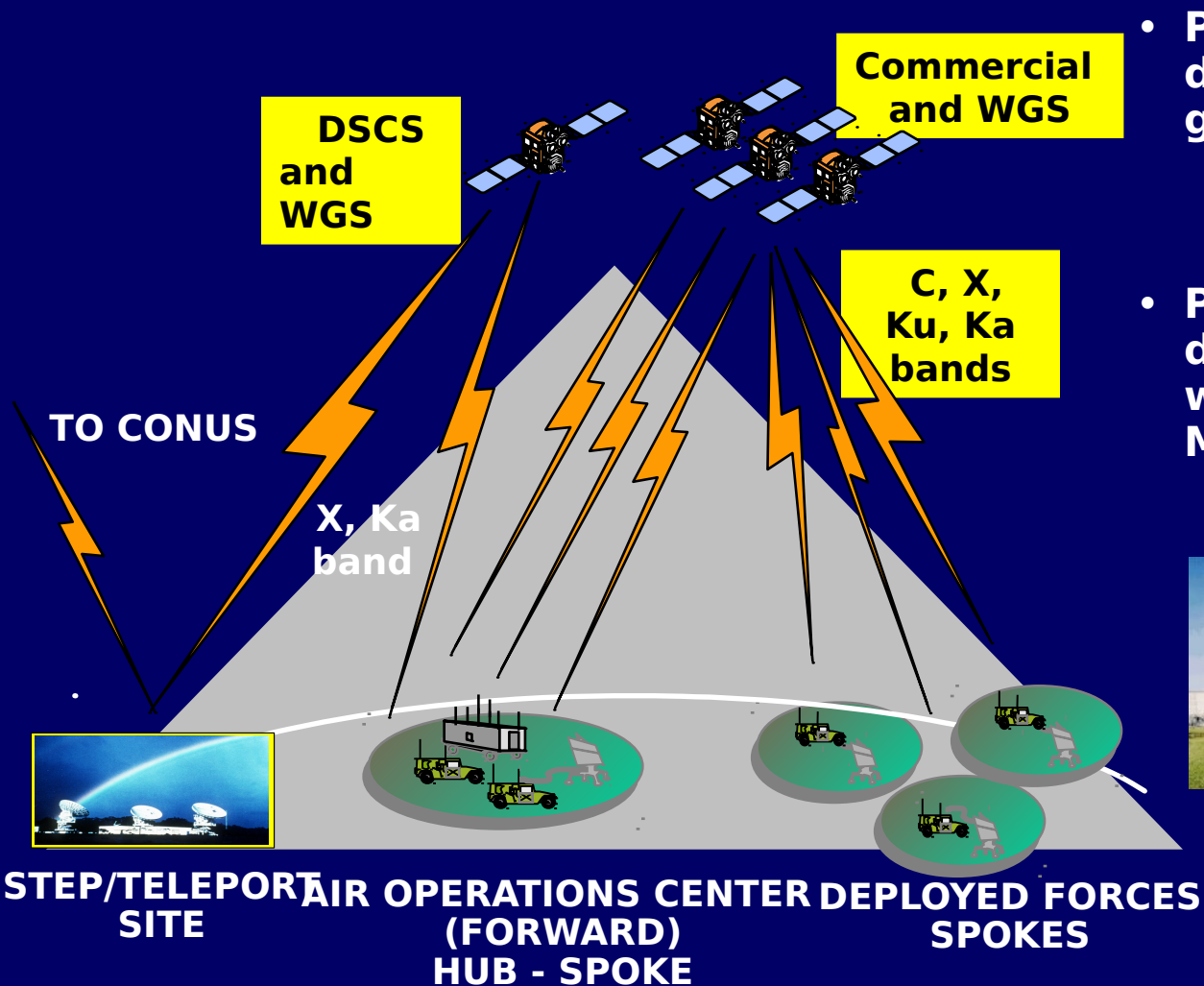
- **Implement open layered architecture**
 - Address full range of future needs
 - Facilitate 'forward compatibility'
 - Implement Family of Terminals strategy
 - Provide 'network-ready' capability
 - Be fully compliant with the Software Communication Architecture
- **Provide protected communications capability (EHF XDR) for strategic 'force element' aircraft**



- **Replace/upgrade existing airborne, ground, and ground transportable Milstar command post terminals**
 - Provide terminals for AEHF satellite command & control



GMT Baseline

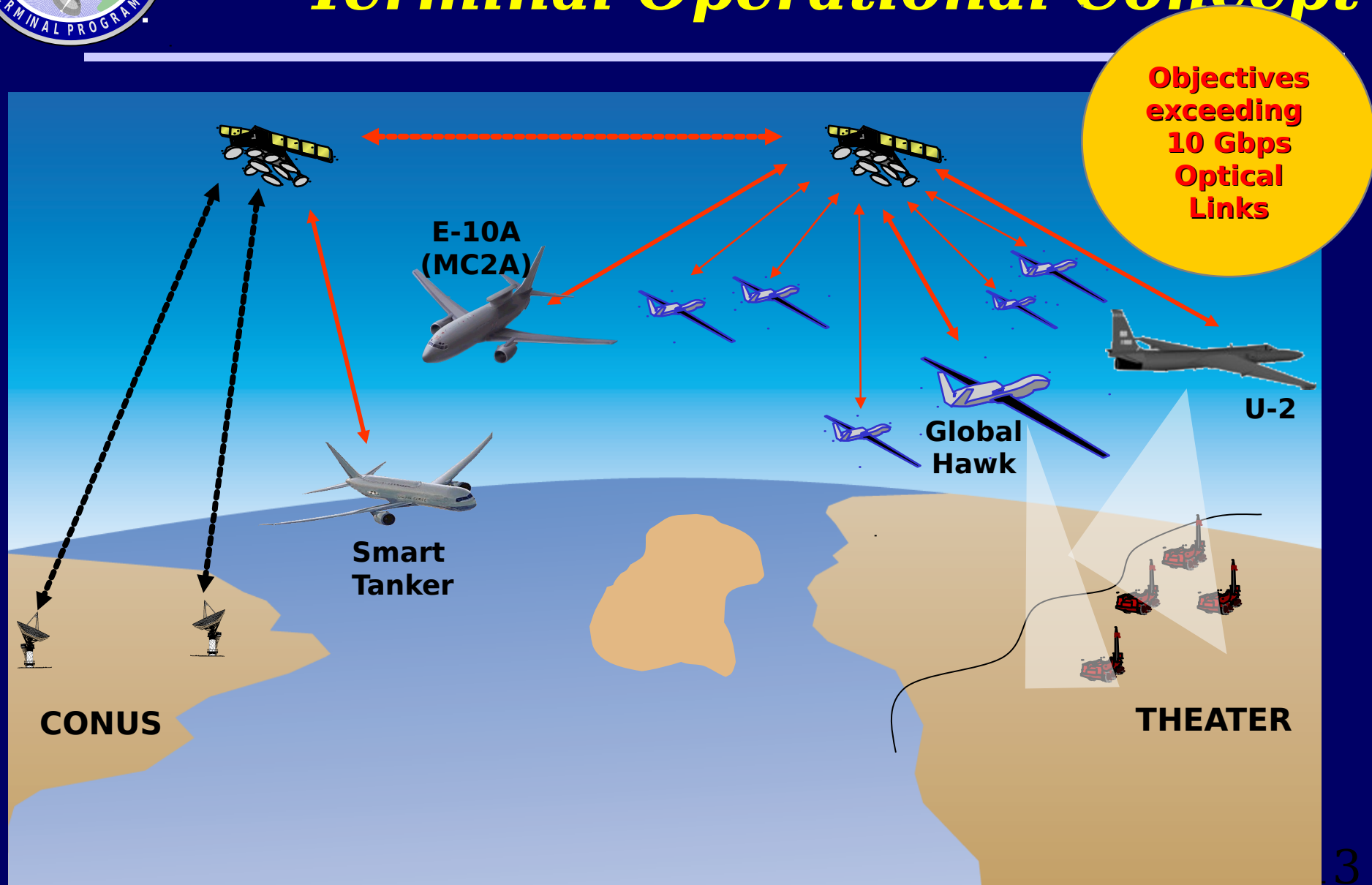


- Provides warfighters, deployed worldwide, with global connectivity
 - NIPRNET, SIPRNET, GCSS, etc
- Provides voice, imagery, data, video, and VTC comm with data rates up to 50 Mbps

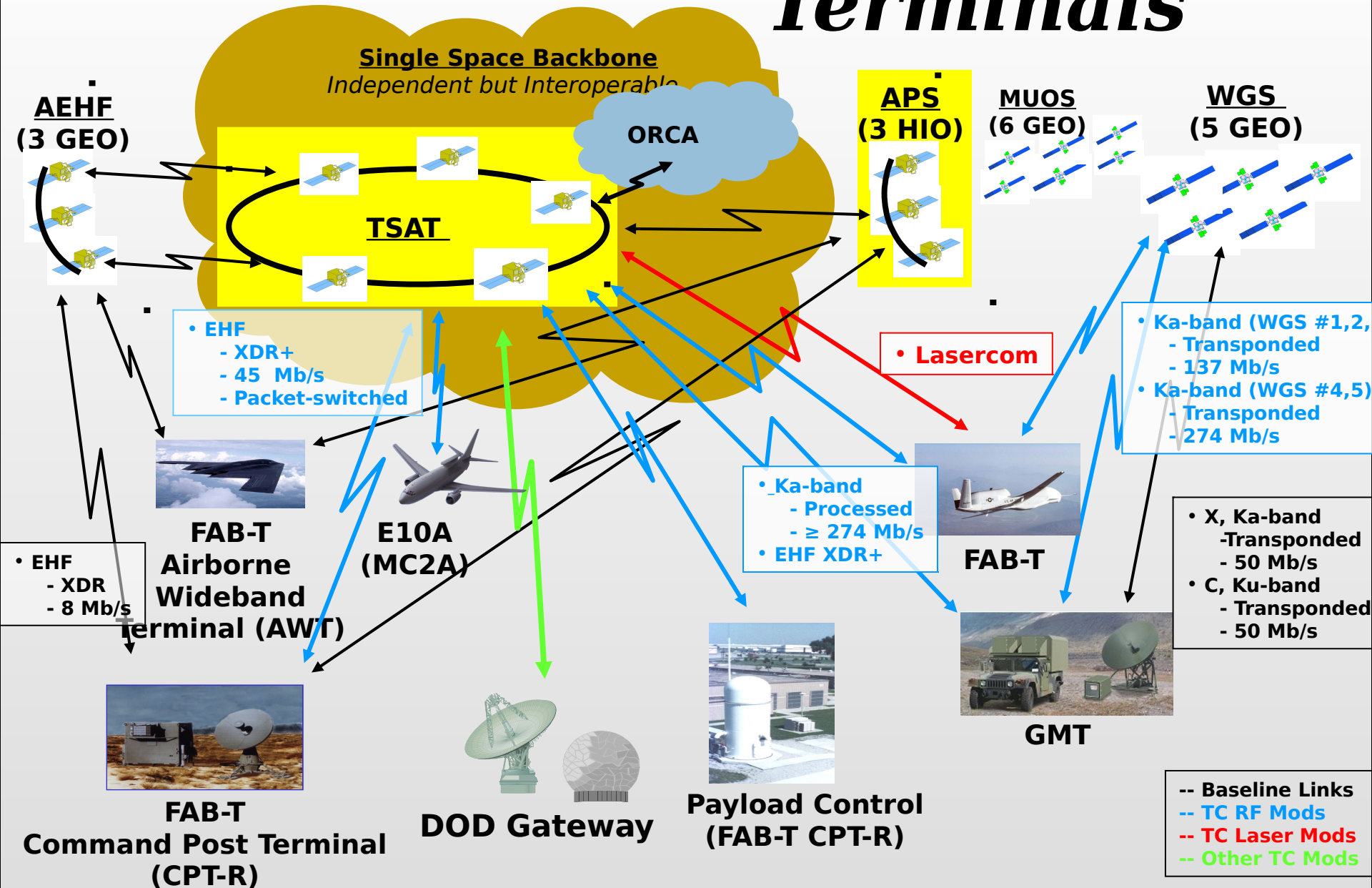




Airborne Lasercom Terminal Operational Concept



TC Services and AF Terminals



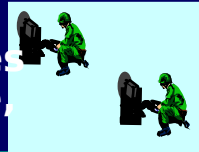


Family of Terminals (FOT) Concept

Today

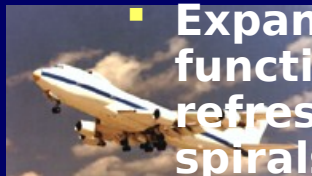


TC Era



- Protected: Milstar Command Post, SCAMP, SMART-T
- Wideband: DSCS, GBS Receive Suites
- Narrowband: AFSOC DAMA Airborne

- AF has over 100 different MBMR terminal types, each requiring specialized personnel to operate & maintain
- Terminal costs comprise over 50% of the MILSATCOM system life cycle cost



- Protected: **FAB-T**
- Wideband: **FAB-T**, GMT, DSCS, **Laser**
- Narrowband: AIT, SPITFIRE, MBMMR

- **Common Design/Common Interfaces - across multiple platforms**
- **SCA compliant architecture**
- **Scaleable - to add or reduce functionality based on specific mission needs**
- **Expandable/Evolvable - to add functionality & refresh technology in future spirals/upgrades**

FOT Concept drives the AFC2ISRC SATCOM Terminal Roadmap



FOT Layered Architecture Provides “Forward Compatibility”

- Define architecture to encompass full range of capabilities for multiple programs & contractors
 - Various communication capabilities
 - Various antenna group configurations
 - Multiple packaging options
 - Multiple operator interface group configurations
- Develop additional increments as needed/funded
 - Additional capabilities, platforms and users
- “Design-in” capability to add increments as systems change
 - In support of Transformational Communications
 - Incorporate evolving technology and user needs with unique spirals that feedback/feed-forward to support future increments



Establishing the Family Product Line

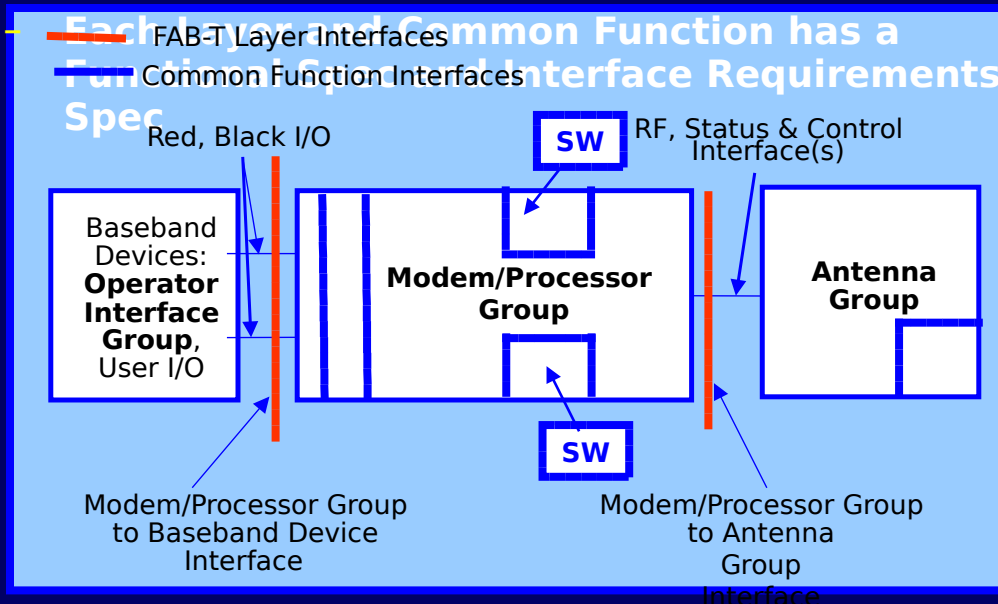
- Determine an overarching layered architecture
 - Framework established in the FAB-T TRD
 - Three layers = Equipment Groups
 - Some layer interface requirements identified
 - Remaining details will be contractor developed
 - Common Functions
 - Software Communications Architecture based
- Develop a definition of each Layer/Common Function

3 Layer interface characteristics:

- **Common**, that is the same for each family member
- **Open**, i.e., published/non-proprietary, supporting existing standards (preferably JTA compliant)
- **Exposed/exposable**, either physically separate or capable of being separated

5 Layer interface definition attributes:

- **Physical** characteristics
- **Electrical** characteristics
- **Framing** structure
- **Protocols** used across the interface
- **Semantics** - command set specific to the interface

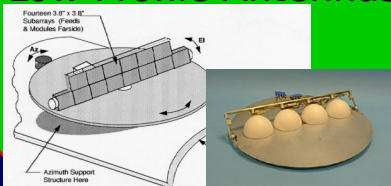




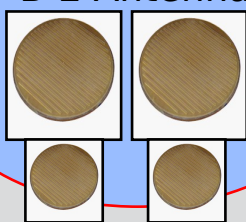
FAB-T Layered Architecture Example

B-52

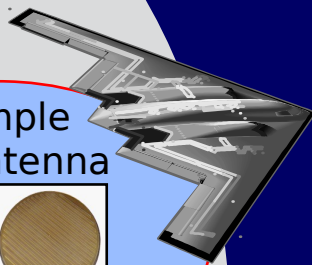
Example Low-Profile Antennas



Example B-2 Antenna



B-2



Antenna Group

Abn CP

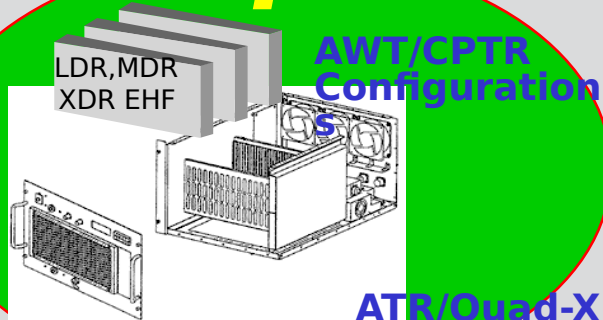


Existing CPT Antenna Systems



Gnd CP

Gnd Contingency



AWT/CPTR Configuration

ATR/Quad-X Packaging

Modem/Processor Group

COMSEC

Baseband Interfaces

Operator Interface Group

User I/O Devices

- CP retained/program provided eq
- Program-provided equipment
- Platform-provided equipment

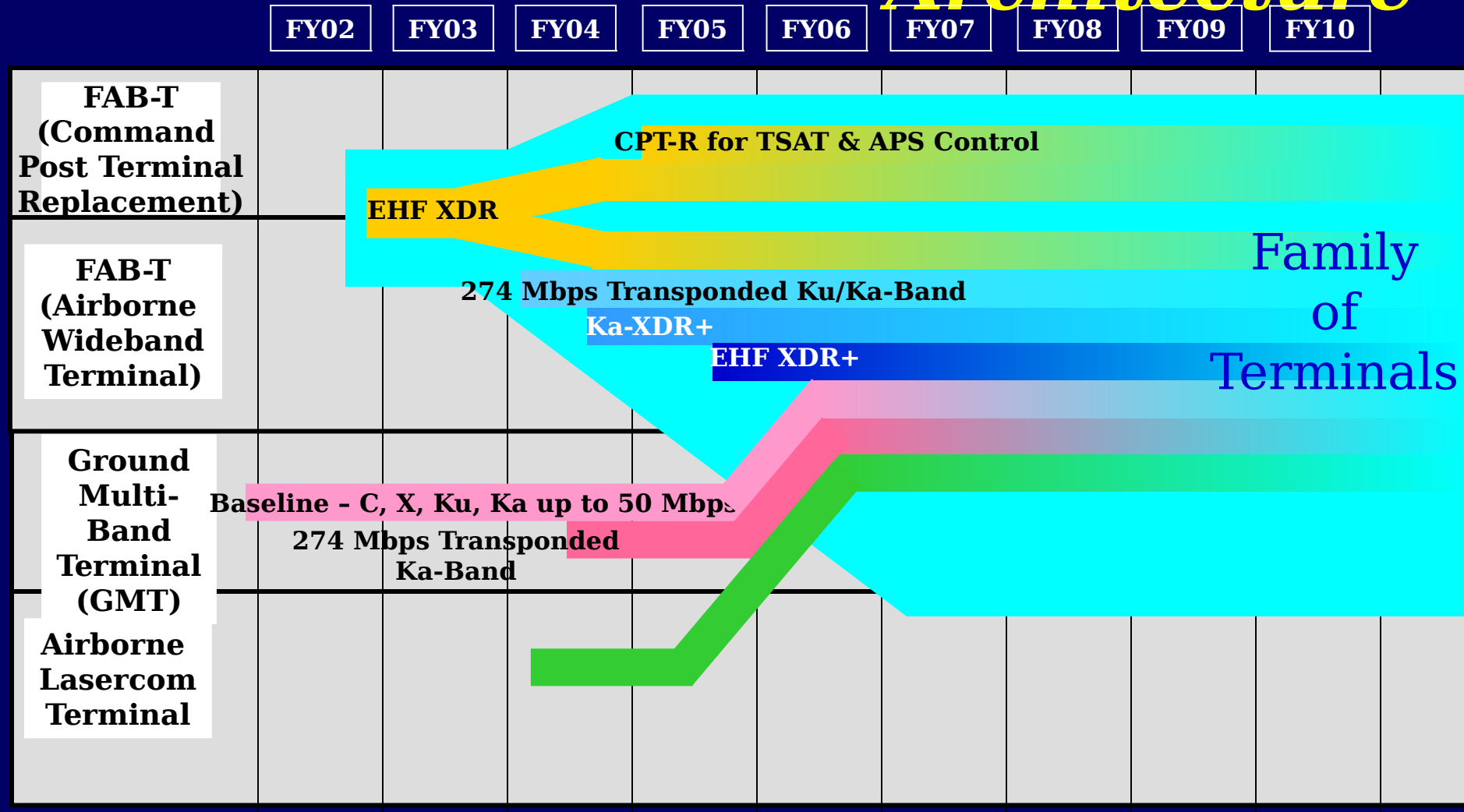


Benefits of Family of Terminals Approach

- Leverage development for multiple platforms
- Provide “plug and play” capability
 - Component reuse from existing family product line to new users
 - Newly developed capability can be used in fielded terminals
- Economy of Scale
 - Common components can be used on many platforms
- Reduces life cycle cost
 - Common user interfaces and components reduce operations costs
 - Common components reduce supportability costs and forward spares needed for deployability
 - Decrease training burden



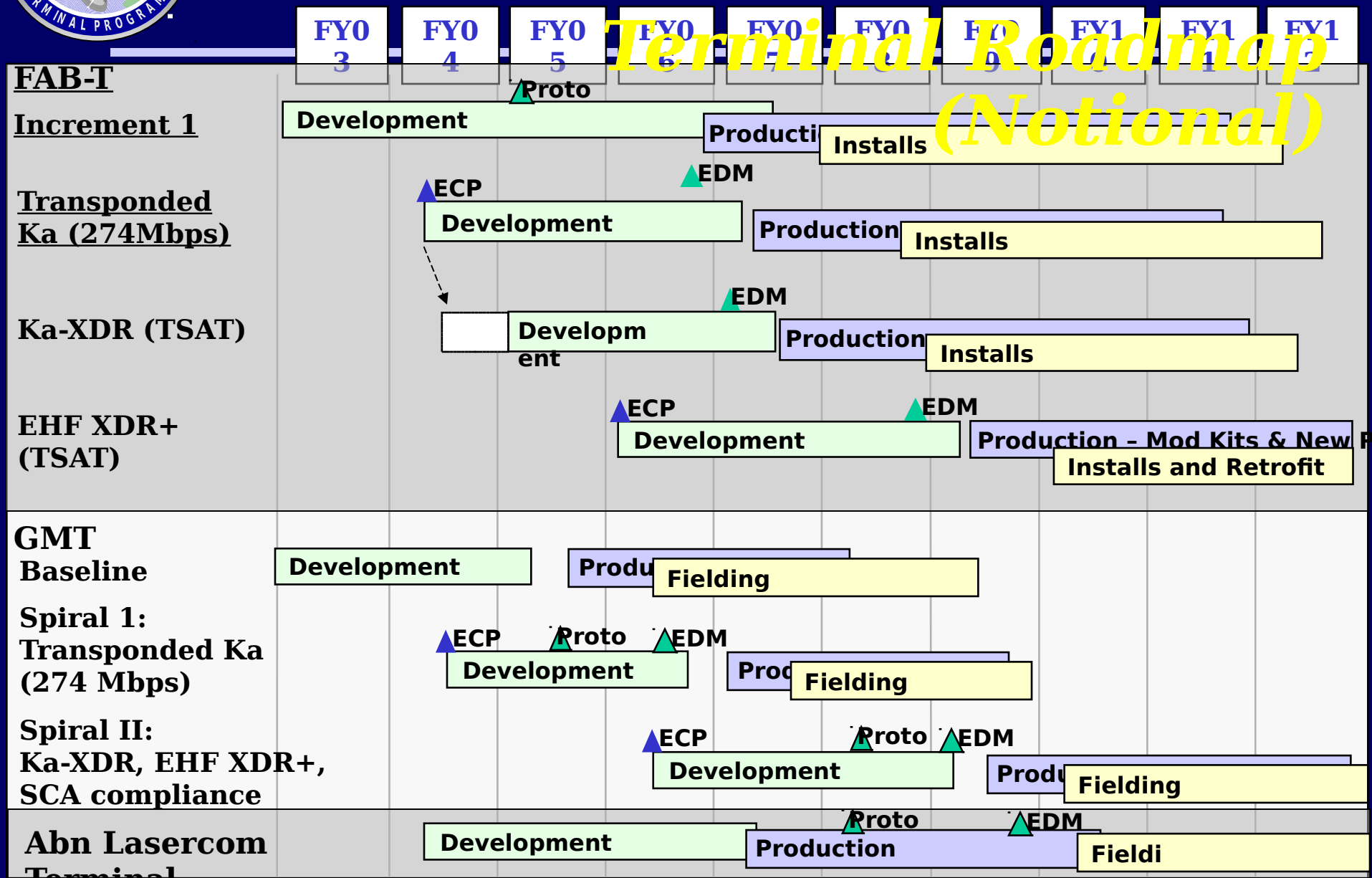
Projected Migration Plan for AF Terminals to Family Architecture





Transformational Communications

Terminal Roadmap (Notional)





Summary

- AF Terminals targeted for TC include FAB-T, GMT, and Airborne Lasercom Terminal
 - All migrating to common family
- Family of Terminals layered concept and SCA flexibility enable terminals to evolve as CONOPS and user needs change
- Family of Terminals concept has positioned AF to exploit the TC capabilities by simply adding new “siblings” to the family

Providing Connectivity to the Warfighter

- Any Time, Any Place